

# 1988 ARRL NATIONAL CONVENTION

Portland, Oregon

"The City of Roses"





ICOM

Handhelds



# HOW DO YOU PACK 7 WATTS, 20 MEMORIES AND SCANNING INTO A HANDHELD?

**IC-2GAT:** 7 Watts Rx 138-174MHz, Tx 140-150MHz

**IC-4GAT:** 6 Watts 440-450MHz

**IC-32AT:** 5 Watts Rx 138-174MHz/440-450MHz  
Tx 140-150MHz/440-450MHz

## A New Generation of Powerful, Versatile Handhelds.

Select a new "G Series" or dual band ICOM transceiver and enjoy full base station luxury in a portable unit designed especially for you!

- **Maximum Frequency Coverage.** The IC-2GAT receives 138-174MHz, including NOAA, and transmits 140-150MHz to include CAP and MARS frequencies. The IC-4GAT operates 440-450MHz, and the IC-32AT receives 138-174MHz and operates 140-150MHz/440-450MHz.
- **Most Powerful Handheld!** The IC-2GAT delivers seven watts! The IC-4GAT is six watts and the IC-32AT is five watts! One watt level selectable for local QSO's.
- **20 Memories.** Store any frequency, Tx offset and subaudible tone in any memory. Total flexibility!
- **Programmable Scanning** of band and memories plus easy lockout and instant memory recall.
- **Additional Features.** Battery saver, call channel, all subaudible tones, multi-function LCD readout and DTMF pad.
- **Compatible Accessories.** All ICOM IC-2AT/02AT series battery packs, headsets and speaker mics are interchangeable.
- **Optional UT-40 Beeper** silently monitors a busy channel for your calls. When the pre-programmed subaudible tone is received, the unit beeps and the LCD flashes.



**IC-32AT**  
2 Meters and  
440MHz

**IC-2GAT**  
2 Meters

**IC-4GAT**  
440MHz

**ICOM**  
First in Communications

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004  
Customer Service Hotline (206) 454-7619

3150 Premier Drive, Suite 126, Irving, TX 75063

1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349

ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9,  
Richmond, B.C. V6X 2T4 Canada

All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. H1488.



ICOM

IC-781 HF Transceiver



# THE FUTURE OF AMATEUR COMMUNICATIONS

Once in a lifetime, a transceiver is introduced that's so extraordinary and innovative that it opens a totally new era in HF communications. ICOM's pacesetter IC-781 proudly exhibits that hallmark achievement with futuristic designs and features of true legendary proportions. Whether DX'ing, contesting, pioneering new interests or enjoying unquestionable top-of-the-line performance, the IC-781 is indeed today's standard of excellence!

**Multi-Function Five Inch CRT.** Displays frequencies, modes, memory contents, operating notes, RTT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



**Unique Spectrum Scope.** Continuously indicates all signal activities and DX pileups with your operating frequency in the center. Selectable horizontal frequency spans of 50,

100, and 200kHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contesteer's dream!



**Dual Width Noise Blanker** includes MCF filter plus level and width controls to eliminate pulse and woodpecker noise with minimum adjacent-signal interference.

**Incomparable Filter Flexibility.** Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters are independently selectable!

**Dual Watch.** Simultaneously receives two frequencies in the same band! Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

**DX Rated!** 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

**Twin Passband Tuning** with separate controls for second and third IF stages! Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. It's DX'ing Dynamite!

**A Total Communications System!** Includes built-in 100% duty AC supply, high speed automatic antenna tuner, Iambic keyer, semi-automatic or full QSK CW break-in to 60 wpm, Audio Peaking Filter (APF), RF speech processor, multiscanning, 105dB dynamic range, all-band/all-mode receiver with general coverage, and much more!

**ICOM Dependability.** The phenomenal IC-781 is built for action and backed with the most extensive warranty in the industry.

See the IC-781 at your local ICOM dealer.

**ICOM**  
First in Communications

ICOM America, Inc., 2380 118th Avenue N.E., Bellevue, WA 98004  
Customer Service Hotline (206) 454-7619  
3150 Premier Drive, Suite 126, Irving, TX 75063  
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All stated specifications subject to change without notice or obligation.  
All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 761188.



# Greetings!

September, 1988



To the Amateur Radio Operators:

Welcome to Portland!

We are glad you are here for the Portland '88 American Radio Relay League National Convention, and know you will have a great time.

Amateur Radio operators have helped provide essential communications for large community events, such as the annual Cascade Runoff and Portland Marathon. Their assistance with Portland's Rose Festival Parade keeps parade officials in constant communication. The City of Portland appreciates having such highly skilled and professionally equipped communicators volunteering assistance to our Office of Emergency Management.

Although I know you are busy with convention activities, I hope you will take some time to explore and enjoy all Portland has to offer. I think you will find your Portland ham radio hosts eager to make this convention one of your most memorable, ever.

Sincerely,

**J. E. Bud Clark, Mayor, City of Portland**

Dear Fellow Radio Amateurs and Other Visitors:

It is a distinct pleasure to welcome you to the ARRL National Convention for 1988 being held in Portland, Oregon.

The Convention Committee has planned for you a full program of diverse and interesting forums, presentations, demonstrations and talks. You can come away from this National Convention better informed about the events which will shape amateur radio in the 1990's...and have fun in the process too!

The exhibitors at this Convention have also gone to considerable expense to display for your review all the latest in amateur gear.

All in all, it promises to be a wonderful experience as only our friends here in the Northwest can host...

Enjoy.

73,

**Larry E. Price, W4RA, President, ARRL**



Dear Fellow Amateurs and Guests:

On behalf of the Convention Committee and the Northwest Amateur Radio Council, I take this opportunity to welcome you to the 1988 ARRL National Convention.

If this is your first trip to the Northwest, please avail yourself of our information table, to pick up tips on what to do and see while you are here.

Be sure to familiarize yourself with your program brochure. There's lots of fine print and it's easy to overlook something that might be important to you. We have tried our best to include as much information as possible, but if any area leaves you in doubt, check with the information table. Five hourly prize boards are located at strategic places here in the Red Lion. We'll post any changes in the daily schedule on these boards, as well.

Here's hoping your stay in Portland is enjoyable and your return home will be filled with fond memories. Whether arriving or leaving, the red carpet is out to you!

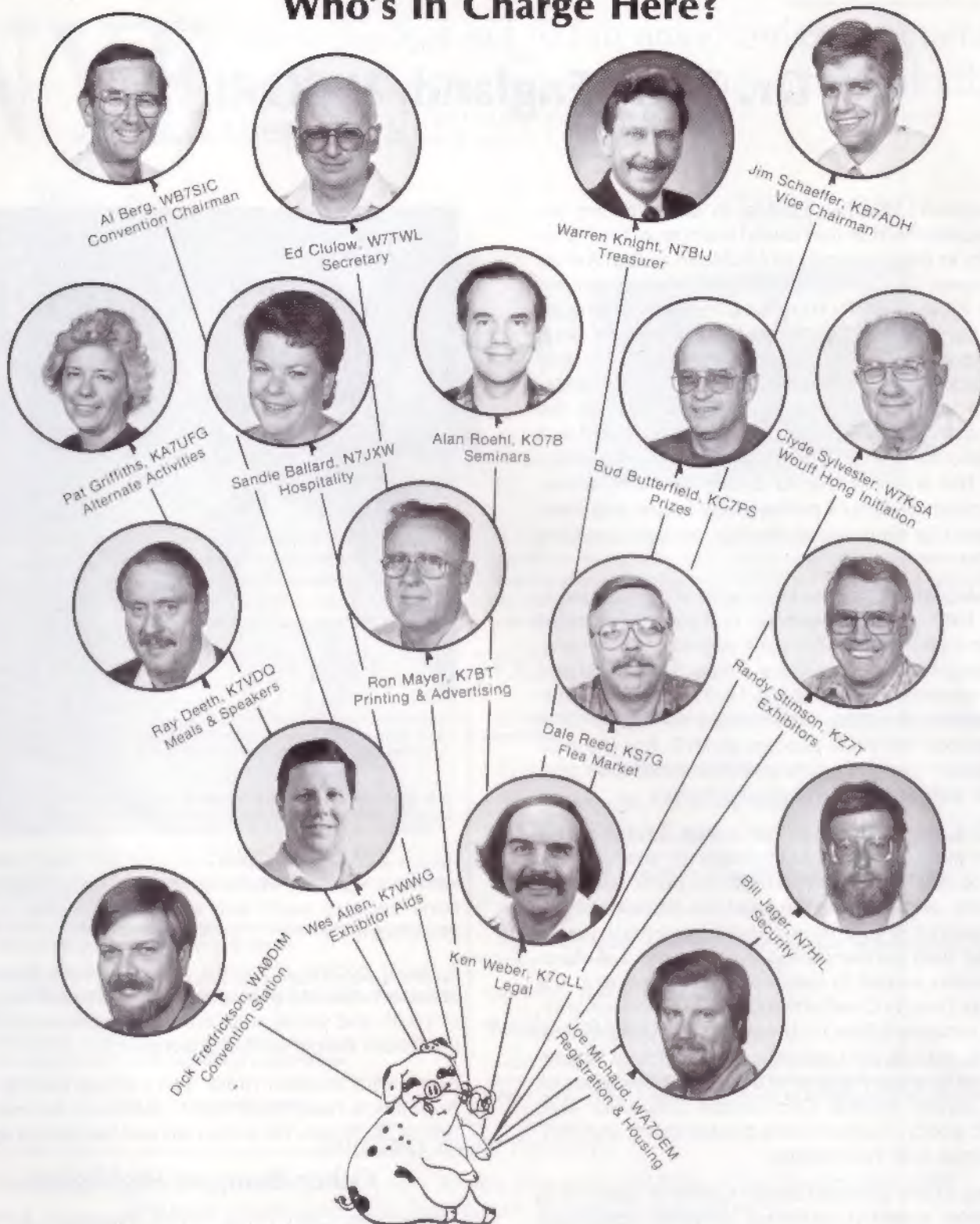
73 in '88'

**Al Berg, WB7SIC, Convention Chairman**





# Who's In Charge Here?



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## Dr. Tony England, WØORE

Tony England, WØORE, comes to us following his recent appointment as the newest member of the Physics faculty at the University of Michigan at Ann Arbor. Better known as the Astronaut-Ham who communicated by Slow-Scan TV from Earth orbit, our banquet speaker can't stay put. Born in Indianapolis in 1942, Tony graduated from high school in North Dakota, and then attended and received his degrees from the Massachusetts Institute of Technology. That was just the beginning. In the years following his appointment as a NASA astronaut, he took field assignments in Geology all over the western United States and Antarctica. Indeed, much of Tony's professional career has been with the U.S. Geological Survey in one capacity or another.

NASA selected Dr. England as a scientist-astronaut in August, 1967. He subsequently completed the initial academic training and a 53-week course of flight training at Laughlin Air Force Base, Texas. He served as a support crewman for the Apollo 13 and 16 flights. During this stint with NASA, which ended in August, 1972, he completed his Ph.D. studies at MIT. For the next almost seven years, Tony worked as a research geophysicist with the U.S. Geological Survey.

At U.S.G.S., his duties took him to the Southwest for heat flow measurements, to Montana for geomagnetic studies, to Washington and Alaska for radar sounding of glaciers, and all over the west for microwave airborne research in geothermal areas. Tony participated in and led field parties during two seasons in Antarctica. He also served in leadership positions with the Survey, as Deputy Chief of the Office of Geochemistry, and as Associate Editor for the *Journal of Geophysical Research*. He has also served on the National Academy's Earth Science Panel of the Space Science Board, and on several Federal Committees concerned with Antarctic policy, nuclear waste containment, and Federal Science and Technology.

Returning to the Johnson Space Center in June, 1979, as a senior scientist-astronaut (mission specialist), Tony was assigned to the operation mission development group of the astronaut office, which he eventually managed. Here, he served as a mission specialist on Spacelab-2 Mission STS-51-F, which launched from Kennedy Space Center, Florida, on July 29, 1985. This was the first pallet-only Spacelab mission, and the first in which the Instrument Pointing System (IPS) operated. His mission assignment was activating and operating the Spacelab systems, running the IPS and the Remote Manipulator System and assisting with on-board experiments. He also operated his amateur



NASA Photo

station on board, exchanging pictures in both directions between earth and space for the first time on Slow Scan TV.

A major portion of Tony's operating time aboard the space shuttle was geared toward contacts with groups of youth and young amateurs. He is also working with the Youth Forum at this convention.

Along with amateur radio, Tony enjoys sailing, which he will now have more time to pursue in his new location in Michigan. He is married and has two daughters.

### Other Banquet Highlights:

Remarks by Larry Price, W4RA, President, ARRL

Chapter 1 of the hilarious skit, "The Story of a Ham," starring Stanley Hamm

### Presentation of Major Awards:

**Ambassador of the Year (AEA)** to Former Sen. Barry Goldwater, K7UGA.

**International Humanitarian of the Year (ARRL)** to Father Marshall Moran, 9N1MM

Banquet Master of Ceremonies is The Hon. Greg Milnes, W7AGQ



# **NYE** Takes the fear out of full power antenna tuners, and the guesswork out of PEP measurement with these two MUST SEE PRODUCTS!!

**MB-V-A**



Discover this durably built, feature packed MB-V-A Antenna tuner. You'll find operating conveniences that make antenna tuning a snap and value engineered to do the job over wide operating ranges. Compare quality, features and the NYE VIKING TWO YEAR WARRANTY.

**RFM-003**



Get correct easy to read measurements of PEP for SSB, AM, and Pulse along with full time completely automatic SWR display with this unique Power Monitor System. Two models to choose from: The RFM-003 for 3KW indication and the RFM-005 for 5KW.

## **CHECK THE FEATURES:**

\* **Pi Network.** Low Pass Pi Network tuning 1.8-30 MHz. Heavy duty silver plated continuously variable inductor with 25:1 vernier dial. 7000 volt variable capacitor and 10,000v switch selected fixed capacitors on output side. Tunes 40-2000 ohm loads. Good harmonic suppression!

\* **Automatic SWR.** Hands free metering of SWR. No reset or calibration needed. Separate power meter - 300 or 3000 w f.s. automatically switched. Easy to read 2.5" recessed and back-lighted loud band meters.

\* **Antenna Switch.** PUSH-BUTTON antenna switching to (4) antennas (2 coax, single wire and twin lead). Coax bypassed on first coax output. We designed this switch to take the power. Rated at 10KV and 20 amps.

\* **3 KW Balun.** Trifilar wound triple core torroid gives balanced output to twin feeders from 200 to 1000 ohms and unbalanced output down to 20 ohms.

\* **Maximum Power Transfer.** Match your transmitter output impedance to almost any antenna system for maximum power transfer. Amplifiers only run at their designed Q when properly matched.

\* **Model Options.** MB-IV-A1 includes all MB-V-A features less antenna switch and balun. MB-IV-A2 is identical to MB-IV-A1 with the addition of a triple core balun.

\* 1.8 MHz. will not tune on some antennas.

\* **(3) Modes** - Peak Average and Peak and Hold with a unique non-drift Sample & Hold Analog memory circuit.

\* **(2) Ranges** - Automatically switched power scales to 5 KW.

\* **Fully Automatic SWR** - Full time meter displays ratios directly without drift.

\* **Built-in ALO** - Protect your amplifier tube investment with this fast acting lockout

\* **Remote Couplers** - Six feet remotes the interchangeable calibrated couplers.

\* **True RMS Conversion** - N.P. couplers use forward biased full wave detection.

\* **Rugged Construction** - Heavy gauge aluminum construction. Top quality glass epoxy PCB. This meter is built to last.

\* **Accuracy** - Guaranteed to  $\pm 5\%$  F.S.

\* **Warranty** - TWO FULL YEARS -

\* **Added Features** - Switchable reverse power all mode metering - Full status LED Display - Adjustable ALO in switchable SWR/REFL power - Heavy duty Nicad batteries charged by the applied RF for the field and a charger is supplied for fast charging and backlighting of the loud band meters for the back shack.

## **OTHER NYE VIKING PRODUCTS**

Phone Patches - Electronic and Memory Keyers - Squeeze Keys - Straight Keys - Code Practice Sets - SWR Wattmeter for the blind - Low Pass Filters - All Band Antenna and more....

ASK FOR A FREE FULL LINE CATALOG.

## **TO ORDER, CALL YOUR FAVORITE DEALER**

Amateur Electronic Supply  
Ham Radio Outlet  
Henry Radio  
Madison Electronics  
EGE  
R & L Electronics

Barry Electronics  
C-Comm  
Missouri Radio  
Portland Radio Supply  
Texas Towers  
Ham Station



**Wm. M. Nye Co. Inc.**

1614 130th Ave N.E.  
Bellevue, WA. 98005

TEL: (206) 454-4524  
FAX: (206) 453-5704



# MFJ TUNERS

The world's most popular 3 KW roller inductor tuner with cross-needle meter gives you the widest range matching network available for coax, balanced lines and random wires *plus* you get antenna switch, dummy load and balun - all at a super price . . .

The MFJ-989B is a compact 3 KW PEP roller inductor tuner with lighted Cross-Needle SWR/Wattmeter that handles the highest power of any MFJ tuner! Its roller inductor allows you to get your SWR down to the absolute minimum. And you get other outstanding features like an antenna switch, dummy load, balun and more -- all at an outstanding price.

At only 10 $\frac{1}{4}$ x4 $\frac{1}{2}$ x15, the MFJ-989B matches the new, smaller rigs.

Why can you get your SWR down to minimum every time? Because the MFJ-989B has a roller inductor with 3-digit turns counter plus a spinner



MFJ-989B \$349<sup>95</sup>

knob for precise inductance control. And because it has the widest range matching network available for coax, balanced lines and random wires. And it covers 1.8 to 30 MHz continuously.

The MFJ-989B's 2-color, lighted Cross-Needle Meter not only gives you SWR automatically with no controls to set but also forward and reflected power at a glance!

Plus . . . 6-position antenna switch, 50 ohm dummy load, 4:1 balun for balanced lines, ceramic feed-through, and flip-stand for easy viewing. Meter light requires 12 V.

## MFJ's Best VERSA TUNER II



MFJ's all-in-one Deluxe Versa Tuner II gives you a clutter-free shack and all the features you could ever want at a super price. Here's what you get: coax/balanced line/random wire 300 watt tuner for 1.8-30 MHz, Cross-Needle SWR/Wattmeter, 50 ohm dummy load, 4:1 balun and 6-position antenna switch . . . all in a compact 10x3x7 inch cabinet that matches the smaller new rigs.

You can tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A lighted Cross-Needle meter gives you SWR, forward and reflected power -- all at a glance. A 6-position antenna switch lets you select 2 coax lines, direct or through tuner, random wire/balanced line and dummy load. 1000 volt capacitors, efficient airwound inductor, heavy duty switches.

## MFJ's smallest VERSA TUNER

MFJ-901B \$59<sup>95</sup>

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP Versa tuner -- when both your space and your budget is limited. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced and coax lines continuously 1.8-30 MHz. Excellent for matching solid state rigs to linears. Efficient airwound inductor. 4:1 balun.



144/220 MHz VHF TUNERS

MFJ-920 \$49<sup>95</sup>

MFJ-921 \$69<sup>95</sup>



MFJ's newest VHF tuners cover both 2 Meters and the new Novice 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. MFJ-921 has SWR/Wattmeter.

## MFJ's Fastest Selling TUNER



The MFJ-941D is MFJ's best selling MFJ-941D 300 W PEP antenna tuner! Why? \$99<sup>95</sup> Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz. It matches dipoles, vees, verticals, mobile whips, random wires, balanced and coax lines.

SWR/Wattmeter reads forward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun 1000 V capacitors. 11x3x7 inches.

## MFJ's Mobile TUNER



MFJ-945C \$79<sup>95</sup>

Don't leave home without this mobile tuner! Have an uninterrupted trip as the MFJ-945C extends your antenna bandwidth and eliminates the need to stop, go outside and readjust your mobile whip.

You can operate anywhere in a band and get low SWR. You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8x2x6 inches uses little room. SWR/Wattmeter and convenient placement of controls make tuning fast and easy while in motion. 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, \$3.00.

## 2 KW COAX SWITCHES

MFJ-1702, \$19.95. 2-positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. \$29<sup>95</sup> MFJ-1701

MFJ-1701, \$29.95. 6-positions. Unused positions grounded. For desk or wall mount.



## MFJ's 1.5 KW VERSA TUNER III



The MFJ-962B lets you use your barefoot rig now and have the capacity to add up to a 1500 watts PEP linear amplifier later. Its small size -- 10 $\frac{1}{4}$ x4 $\frac{1}{2}$ x15 inches -- matches the new compact rigs.

A lighted Cross-Needle SWR/Wattmeter makes tuning a snap and gives you SWR, forward and reflected power -- all at a glance.

6-position antenna switch handles 2 coax lines, direct or through tuner, wire and balanced lines. 4:1 balun, efficient airwound inductor with heavy duty ceramic switch, 6 KV capacitors. Flip-stand tilts tuner for easy viewing.

## MFJ's Random Wire TUNER

MFJ-16010 \$39<sup>95</sup>

You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. Handles 200 watts. Ultra compact 2x3x4 in.



## MFJ Artificial RF ground

\$79<sup>95</sup> MFJ-931

You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically place a far away RF ground directly at your rig -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.



ORDER ANY PRODUCT FROM MFJ AND TRY IT -- NO OBLIGATION. IF NOT SATISFIED RETURN WITHIN 30 DAYS FOR A NO-HASSLE REFUND (less shipping).  
• One year unconditional guarantee • Add \$5.00 each shipping/handling • Call or write for free catalog, over 100 products.

# MFJ

MFJ ENTERPRISES, INC.  
Box 494, Miss. State, MS 39762

FOR YOUR NEAREST DEALER OR TO ORDER

800-647-1800

Call 601-323-5869 in Miss. and outside continental USA. Telex 53-4590 MFJ STKY. In CANADA call TEXPRO 416-332-5944.



MFJ . . . making quality affordable



# MFJ multi-mode data controller



**MFJ shatters the 6 mode barrier and the price barrier with the MFJ-1278 and gives you . . . Packet, RTTY, ASCII, CW, WEFAX, SSTV and Contest Memory Keyer . . . 7 digital modes . . . for an affordable \$249.95**

Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable \$249.95.

**Plus** you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

**You'll find it the most user friendly of all multi-modes.** It's menu driven for ease of use and command driven for speed.

**A high resolution 20 LED tuning indicator lets you tune in signals fast in any mode.** All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz -- and it shows you which way to tune!

**All** you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

**You** can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, \$19.95 each.

## Packet

**Packet** gives you the fastest and most reliable error-free communications of any amateur digital mode.

**With** MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

**Extensive** tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

**Hardware** DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

**A hardware HDLC** gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

**Good** news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORL/WA7MBL bulletin board TNC.

## Baudot RTTY

**You** can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300

baud. **You** can copy not only amateur RTTY but also press, weather and other exciting traffic.

**A high performance modem** lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

**You** can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. This lets you operate MARS and standard VHF FM RTTY.

**You** get both the American Western Union and the international CCITT character sets. Autostart for unattended reception and selectable "Diddle".

**A** receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

## ASCII

**You** can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

## CW

**You** get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

**A huge** type ahead buffer lets you send smooth CW even if you "hunt and peck".

**You** can store entire QSOs in the message memories. If you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

**A tone Modulated CW** mode turns your VHF FM rig into a CW transceiver for a new fun mode. It's perfect for transmitting code practice over VHF FM.

**An** AFSK CW mode lets you ID in CW.

**The** CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

**You** also get a random code generator that'll help you copy CW faster.

## Weather FAX

**You'll** be fascinated as you watch WEFAX signals blossom into full

fledged weather maps on your printer. Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

**Any** Epson graphics compatible printer will print a wealth of interesting pictures and maps.

**Automatic** sync and stop lets you set it and leave it for no hassle printing.

**You** can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

**Pictures** and maps can be printed to screen in real time or from disk on IBM and compatibles with the MFJ-1284 Starter Pack.

**You** can transmit FAX pictures right off disk and have fun exchanging and collecting them.

## Slow Scan TV

**The** MFJ-1278 introduces you to the exciting world of slow scan TV.

**You'll** not only enjoy receiving pictures from thousands of SSTVs all-over-the-world but you can send your own pictures to them, too.

**You** can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

**You** can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

**You** can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

**The** MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

## Contest Memory Keyer

**Nothing** beats the quick response of a memory keyer during a heated contest.

**You'll** score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

**You** get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

**Message** memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

**You** get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

**A** weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

## More Features

**Turn** on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

**Plus . . .** printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved, 9x1 1/2x9 1/2 inches, 12 VDC or 110 VAC.

Get yours today and join the fun crowd!

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or to order call toll free

**800-647-1800**

**One Year Unconditional Guarantee**

# MFJ

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# Schedule of Events

## Friday, September 9, 1988

Registration	9:00 a.m. - 6:00 p.m.
QCWA Hospitality — Pendleton Room —	All Day
Flea Market	12:00 noon - 8:00 p.m.
Ladies' Hospitality — Mt. Bachelor Wing Lobby —	1:00 p.m. - 3:00 p.m.
Seminars	2:30 p.m. - 7:00 p.m.
Code Speed Championship Preliminaries — Jantzen Room —	2:00 p.m. - 5:00 p.m.
Wild West Casino Night — Columbia River Ballroom —	7:30 p.m. - 10:30 p.m.

— EXHIBITS OPEN SATURDAY MORNING —

## Saturday, September 10, 1988

DX Breakfast & Program — Multnomah/Clackamas Rooms —	7:30 a.m. - 9:00 a.m.
Registration	7:00 a.m. - 6:00 p.m.
QCWA Hospitality — Pendleton Room —	All Day
Ladies' Hospitality — Mt. Bachelor Wing Lobby —	8:15 a.m. - 9:00 a.m.
Flea Market	9:00 a.m. - 6:00 p.m.
Legal Forum & Lunch — Clark Room —	9:00 a.m. - 1:30 p.m.
Exhibits — Grand Ballroom —	9:00 a.m. - 5:00 p.m.
Seminars & Forums	9:00 a.m. - 5:30 p.m.
Exams — Willamette Room, Red Lion Columbia River Inn —	9:00 a.m. - Noon
Code Speed Championship — Jantzen Room —	9:30 a.m. - Noon
QCWA Luncheon — Multnomah Room —	Noon - 1:30 p.m.
Ladies' Luncheon — Clackamas Room —	Noon - 1:30 p.m.
Exams — Willamette Room, Red Lion Columbia River Inn —	1:00 p.m. - 5:00 p.m.
Code Speed Championship Finals — Jantzen Room —	2:00 p.m. - 5:00 p.m.
Columbia Gorge Tour	2:00 p.m. - 5:00 p.m.
Cocktail Reception — Lower Level —	6:30 p.m. - 7:30 p.m.
Banquet & Program — Columbia River Ballroom —	7:30 p.m. - 10:30 p.m.
Wouff Hong Initiation Ceremony* — Consolidated Room —	Midnight

\*\$1 Admission Fee, payable at the door.

## Sunday, September 11, 1988

ARRL Breakfast & Forum — Multnomah/Clackamas Rooms —	7:30 a.m. - 9:00 a.m.
Registration	8:00 a.m. - 1:00 p.m.
QCWA Hospitality — Pendleton Room —	All Day
Ladies' Hospitality — Mt. Bachelor Wing Lobby —	9:00 a.m. - 10:00 a.m.
Flea Market	9:00 a.m. - 1:00 p.m.
Seminars & Forums	9:00 a.m. - Noon
Exhibits — Grand Ballroom —	9:00 a.m. - 2:00 p.m.
Flea Market Auction — Parking Lot —	11:00 a.m. - 12:30 p.m.
Grand Prize Drawing — Columbia River Ballroom	1:30 p.m. - 2:30 p.m.
Convention Closes	3:00 p.m.



# Grand Prize Drawing

(Need not be present to win those items listed).

Kenwood TS-140S HF Transceiver  
ICOM IC-735 HF Transceiver  
Yaesu FT-747-GX HF Transceiver  
Alinco ALD24T Dual Band VHF/UHF Transceiver  
Heathkit 1KW HF Amplifier Kit  
ACC Shackmaster Station Controller  
AEA PK-232 Multi-Mode Controller  
MFJ 949-C 300-Watt Tuner

**PLUS** — other items from ICOM, Kenwood, Yaesu, Heath, MFJ, HAL, Orion, Opto-Electronic, C-Comm, Motron, Larsen, and more

**PLUS** — over 100 hourly prizes, with values up to \$300.00

## —Early Bird Prizes—

(All three will be awarded, need not be present to win)

Yaesu FT-209RH 2-meter HT  
Kantronics "KAM" Multi-mode Controller  
Falcon 5123-A 2-meter amplifier

## —Banquet Prizes—

Bearcat 50XL Scanner  
5" B&W TV - AC/DC  
4 days, 3 nights at Disneyland, with lodging at the Hilton Hotel

Hourly prizes will be posted for 2 hours on 5 separate bulletin boards on the Red Lion premises.

We will hold the Grand Prize Drawing in the Columbia River Ballroom (on the lower level) at 1:30 p.m. Sunday



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AES - Las Vegas, NV  
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Burghardt Amateur Center - Watertown, SD  
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EGE, INC. - Salem, NH  
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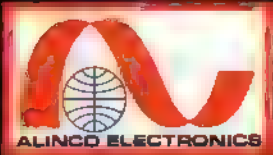
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Michigan Radio - Mt. Clemens, MI  
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5 (W) x 2 (H) x 6 1/4 (D)  
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Doo's Communications-Roseville, CA.  
El Original Electronics-Brownsville, TX.  
EEB-Virginia, VA.

EGE, INC.-Woodbridge, VA.  
EGE, INC.-Salem, NH.  
Erickson Communications-Chicago, IL.  
Floyd Electronics-Collinsville, IL.  
The Ham Station-Evanville, IL.  
The Ham Hut-Amarillo, TX.  
Henry Radio-Hartford, CT.  
Henry Radio-Los Angeles, CA.  
HR Electronics-Muskegon MI.  
HRO-Anaheim, CA.  
HRO-Atlanta, GA.  
HRO-Birmingham, CA.  
HRO-Oakland, CA.  
HRO-Phoenix, AZ.  
HRO-San Diego, CA.  
HRO-Van Nuys, CA.

HSC-Sunnyvale, CA.  
International Radio Systems-Miami FL.  
Jun's Electronics-Culver City, CA.  
Kennedy Electronics-San Antonio, TX.  
KJ Electronics-Cedar Grove, NJ.  
Madison Electronics-Houston, TX.  
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W&G Electronics-Miami, FL.  
Omni Electronics-Laredo, TX.  
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Reno Radio-Reno, NV.  
Rivendell Associates-Derry, NH.

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Texas Towers-Plano, TX.  
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## The Royal Order of the Wouff Hong

The Royal Order of the Wouff Hong will hold its midnight session on Saturday, September 10, to assemble esteemed brothers and to initiate fellow ARRL members into its solemn order. All radio amateurs of the ARRL may attend to renew acquaintances or to be initiated into the secret society.

Admission is \$1.00, which will be collected at the door of the Consolidated Room. Entrance will be from 11:30 p.m. till midnight, whereupon the doors will be sealed!

Great, but what is it? The secret society of the Wouff Hong is dedicated to the finer things of life in the wonderful world of amateur radio. It is dedicated to the preservation of the art: to help improve the art, to keep it clean and enjoyable and to make sure that it remains so for those who follow after us. It is a society for the good, rather than the bad and ugly. It should be a "must" for the older ham as a guiding light, while for the younger ham it is a way to help preserve the future and destiny of a wonderful way of life for all amateur radio operators.

The Royal Order of the Wouff Hong — A society for kinship! See you at midnight!

**Columbia Gorge bus tour tickets are available at the Registration Desk**

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# Alternate Activities

## Color Analysis:

Candace Storset, Certified Color Analyst with Beauty for All Seasons International, will conduct a seminar on Color Analysis.

## Home, Safe Home:

The problem of home security is of ever-increasing importance. Nancy and Chuck Campbell will cover inexpensive and safe methods to insure your families' safety.

## Handwriting Analysis:

Dave U'Ren will explain the fundamentals and how he uses this fascinating skill to screen and evaluate employees for many Oregon companies.

## Oregon Miniature Roses:

Ray Spooner, nationally recognized authority and Consultant Rosarian, will tell us about the care and feeding and what's new in these beautiful roses.

## Rent-A-Mom:

Babysitting is available in your room at all local motels and hotels. Call 503-222-5779 to arrange for service. Rent-A-Mom's dispatch desk is open Friday until 6 p.m. and Saturday from 11 a.m. to 4 p.m.

## Ladies' Luncheon Program:

Victorianna Presents: "Artists and Aprons." Emphasis on the artistry women have employed in the creation of

their fashion; exquisite examples of handwork women have spent hours to create. Seemingly commonplace garments that hold a technical complexity and visual sophistication to be truly appreciated. Fashion mirrors art. A show and tell presentation.

## Schedule of Alternate Activities:

### Friday:

Flanders Room (except Hospitality)

Ladies' Hospitality Room*	1:00 - 3:00 p.m.
Color Analysis Seminar	3:00 - 4:00 p.m.

### Saturday:

Flanders Room (except for Hospitality & bus tour)

Ladies' Hospitality Room*	8:15 - 9:00 a.m.
Color Analysis Seminar	9:00 - 10:30 a.m.
Home Safe Home Seminar	10:30 a.m. - Noon
Ladies' Luncheon	Noon - 2:00 p.m.
Columbia River Gorge Bus Tour	2:00 - 5:00 p.m.
Handwriting Analysis Seminar	2:00 - 3:00 p.m.
Oregon Miniature Roses	3:00 - 4:00 p.m.

### Sunday:

Consolidated Room

Ladies' Hospitality Room*	9:00 - 10:00 a.m.
Women in Ham Radio	10:00 a.m. - Noon
Mary Lou Brown, NM7N, President, YLRL	

\*Ladies' Hospitality in Mt. Bachelor Wing Lobby.

This information is current as of press time, and is subject to revision as needed

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7  
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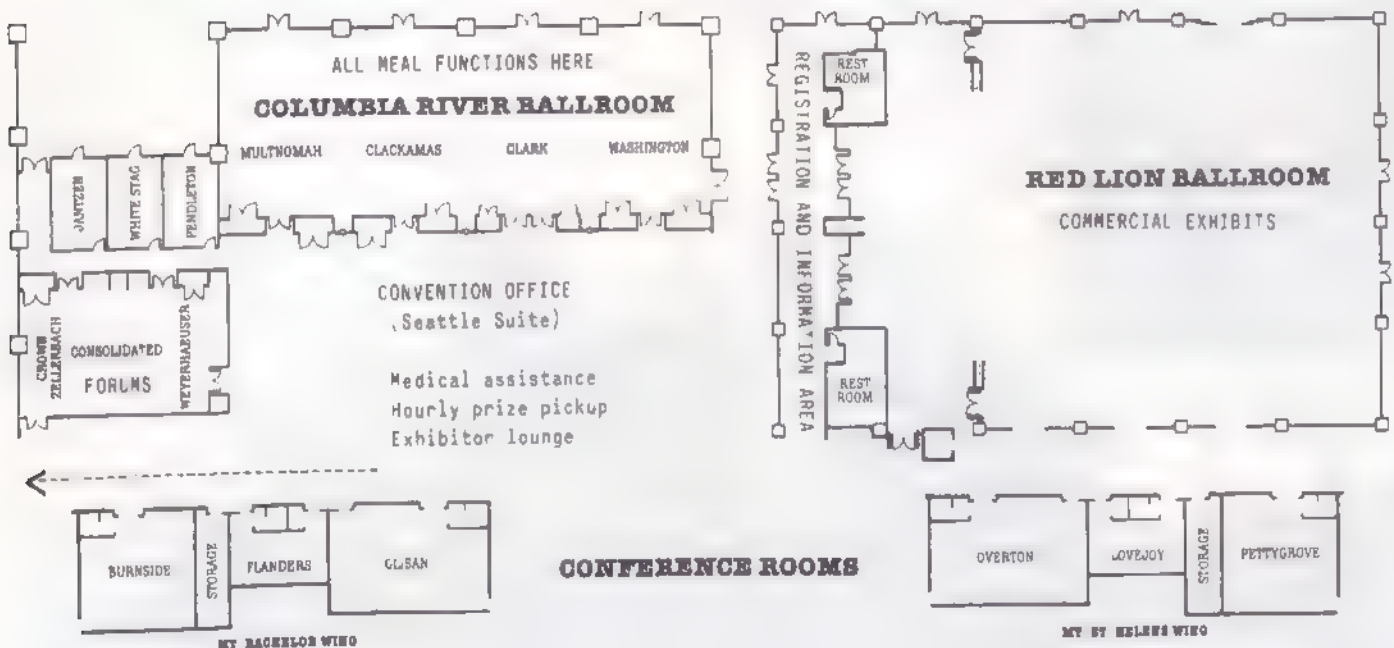
# Convention Exhibitors

(Prize donors are listed in bold type)

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**EPO Software**  
**WorldRadio**  
**Accurate Engraving**  
 Central Oregon Radio  
**Mr. Nicad (E. H. Yost)**  
**Gordon West Radio School**  
**Portland Radio Supply**  
**Hats for Hams**  
**Orlon Hi-Tech**  
**Ham Radio Magazine**  
 Antenna Systems  
**CQ Magazine**  
**Allnco**  
**Amateur Radio School**  
 QCWA  
 ETO Alpha Linears  
**Smiley Antenna**  
 YLRL  
**The DX Bulletin**  
**Yaesu Musen**  
**Public Brand Software**  
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## International Morse Code Speed Championship

An official run for the International Morse Code speed record is being staged during this convention. The standing record of 75+ w.p.m. was set ca. 50 years ago by Ted McElroy, and it has not been officially challenged since that time. We will be conducting our proficiency runs in the Jantzen room on Friday and Saturday.

The preliminaries will get under way Friday afternoon at 2:00 with the entry round at 50 w.p.m. If you are interested in participating, you will need to provide your own means of transcription (electronic typewriters are OK, if they can output in a real-time mode). We will accept recognized proficiency certification from ARRL, Connecticut Wireless Assn., W7JWJ, etc. However, you must be able to copy a certifiable amount at the speed at which you elect to join the contest.

Scoring will be based on the time values of the characters and word spaces sent in a 5-minute transmission. One minute's copy will be sufficient for certification at the speed sent.

There is limited seating available for the final round of the championship, on Saturday afternoon. If you would like to observe the final runs (don't count on being able to copy at those speeds!), there will be a sign-up sheet outside the Jantzen Room through the luncheon hour on Saturday.



## Hello, Stranger!

The convention information booth is located to the west of the main exhibit area in the lobby.

If you stop by our booth, you can get information about the convention, the city of Portland and our region. This is also the place to leave messages for that long-lost or yet-to-be-eyeballed friend. Be sure to check the message board during your stay!

## DX Breakfast Program

The well-known Finnish amateur, Martti Laine, OH2BH, and the president of the SARL (Finnish Amateur Radio League), Seppo Sisalto, OH2BA, will be the featured program speakers at the DX Breakfast, Saturday morning.

Their presentation is: Malyj Vysotskiy Island -- A Piece of Land Where East and West Met -- the 4J1FS operation, 1988. Seppo will be speaking on behalf of the effort in his capacity as SARL President, while Martti will be speaking as the originator of this DXpedition.

Other activities at the breakfast will include a DX Countdown and a DX Parody.

## The Convention Flea Market

For the first time at a convention in this part of the world, we are operating our flea market outdoors, at the west end of the Red Lion Motor Inn parking lot.

The selling hours of the flea market are Friday, from Noon to 8 p.m., Saturday from 9 a.m. to 6 p.m., and Sunday from 9 a.m. to 1 p.m. On Friday, the flea market area will be open to vendors from 9 a.m. to noon for setup, while on Saturday the same situation exists from 7 to 9 a.m. Handicapped individuals will be admitted an hour earlier than shown on all days.

For those vendors who really don't want to lug all their goodies back home after the convention, there will be a special auction on Sunday from 11 a.m. to 12:30 p.m.

## ...And Now for the REST of the Story!

We wish to apologize to those of you who received your registration forms too late to meet the original deadline for the Early Bird prize drawing. The FCC data base was used to mail to ALL hams

in Oregon and Washington, as well as to other selected ZIP code areas.

Some time after the 21,000-piece mailing went out, we determined that the list was terribly outdated -- and an enormous number of the forms did not reach their destinations.

We decided to re-mail (using the ARRL membership list) over 6,000 additional forms. Unfortunately, these re-mailed forms didn't make it out until after the July 15 Early Bird cut-off date. Because of this situation, we have decided to extend the Early Bird prize deadline to those registrations postmarked by August 1, 1988. The best-laid plans, etc ...

Al Berg, WB7SIC  
Convention Chairman

## QCWA Hospitality Room

If you are a member of the Quarter Century Wireless Association, you have a hospitality room available to you. The Pendleton Room (on the lower level) will be set aside for members' use during the entire weekend. It will be a great place to meet and greet friends who are fellow members, so stop by!

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**TINY-2** is our new low-cost high-performance standard for packet controllers. Thousands already in use, world-wide. A perfect beginner's unit. Complete, wired and tested, only **\$119.95**

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# ARRL 1988 Convention - Seminar/Forum Program

		Crown Zellerbach	Weyerhaeuser	Washington	Barnside	Flanders	Gilman	Overton	Lovajoy	Pettygrove
FRI DAY	2:30 p.m.				Dave Phenister, WB7ESV, Birth of a Mobile Antenna	Candace Storset Color Analysis (3:00 p.m.)	Don Peters, WY6U, Myths of Power Amplifiers	E. Austin, W7AXJ, & R. Hanson, W7PJ, What Those Crazy Sound ng Signals Say	Terry Bernier, ARRL Sponsored Group Insurance Plans	Robert Shelton, N2EDF, Navassa DXpedition
	4:00 p.m.				VE Roundtable		Lew McCoy, W1ICP, RFI: A Continuing Problem	Alan Chandler, K6RFK, The Myst que of Ground ng	Ted Benson, W4B8EJ, Computer ized Satellite Identification Se ec- tion & Track ng	Phil Chaney, W4HWZ, & Mel Degraw Electronics & Communications n the FBI
	7:00 p.m.				Sandy Mikalaw, K700Z, Hi-Tech Astronomers meet Ham Radio		Phil Farrell, K7PF, Transmitter Identifica- tion for Fun and Profit	Chuck Northcutt, W7SRZ, Beginning Fast Scan ATV		Van Valkenberg Air Force One Experiences
	9:00 a.m.	Mark Walker, W7CLU, Nov ces and Repeaters			Ken Glanzer, K7GCO, Maximizing Trapped Vertical Efficiency	Candace Storset Color Analysis	Father Moran, 9N1MM, Hamming in Nepal	PUBLIC SERVICE Forum	Tom Hill, WA3RMX, TWT's for Amateur Rad o Microwaves	Terry Bernier, ARRL Sponsored Group Insurance Plans
SAT DAY	10:30 a.m.	MARS Forum		YOUTH Forum	Dick Norton, N6AA, DX Contest Logging Accuracy Study	Chuck & Nancy Campbell Home Safe Home	Harold Price, N6KK, Packet Satellites & TAPR DSP Project	E. Austin, W7AXJ, & R. Hanson, W7PJ, What Those Crazy Sound ng Signals Say	Ken Kopp, K6PP, Antennas & Towers Practical Hints	Wes Hayward, W7ZOL, Pract ca Filter Design for Experimenters
	1:00 p.m.	CONTEST Forum	Bill Henry, K6GWT, RTTY for Beginners	Steve Place, WB1EVL, The ARRL VEC Program	Phil Anderson, WBXI, Digital Communications Now and the Future	Dave U'Ren Handwriting Analysis (2:00 p.m.)	Gordon West, WB6NDA, VHF Tropoducting to Hawaii	Chuck Northcutt, W7SRZ, Beginning Fast Scan ATV	Brad Wells, KR7L, Intro to Traffic and Message Preparation	Al Ruvner, W4ZTMP, An Introduction to Packet Rad o
	2:30 p.m.	DXpedition		FCC Forum	Wayne Overbeck, N6NB, Radiation Hazards of Ham Radio	Ray Spooner Oregon Miniature Roses (3:00 p.m.)	Ray Lewallen, W7EL, Phased Array Antennas	AMSAT Forum	Phil Dunn, Bill Smith & Vic Seaberger, Packet and Traffic	Budd Churchward, WB7FHC, Extended Packet Radio Networks
	4:00 p.m.	DX Forum			Alan Chandler, K7RFX, The Mystique of Grounding		Lew McCoy, W1ICP, SWR		Jan Smith, K86WJZ, ARES/IRACES	Phil Rinaldo, W4RI, Packet - Where do we go from here?
SUNDAY	9:00 a.m.				M. L. "Bib" Gibson, W7JIE, The ARRL Monitoring Service	Larry Tyree, N6TR, Techniques & Morals of Computer Aided Contesting	Gene Holt, WA7PUD, The Evergreen Interthe	Ken Kopp, K6PP, Antennas & Towers Practical Hints	Brian Comer, KF6C, New Computer Controlled Communications Receiver Design & Operation	Ray Heaton, NJ0G, HF Linear Amplifier
	10:30 a.m.		Mary Lou Brown, N4M7N, Women in Ham Radio (10:00 a.m.)		Dave Phenister, WB7ESV, Birth of a Mobile Antenna	L. Clark, N60YU, & M. Young, WB8CXO, Repeater Controllers	Lee Wical, KX168ZF, Everything about HF Propagation	Fred Telewaski, WA7TZY, Phase Noise n Modern Transceivers	Lorraine McCarthy, N8CJD, Passing the VEC Code Exams	Greg Milnes, W7AGQ, How High is High?

This information is current as of press time, and is subject to revision as needed.



# Seminar and Forum Presenters

(Listed in order of occurrence)

## SEMINARS

**The Birth of a Mobile Antenna** Dave Phemister, WB7ESV describes the criteria for design of a mobile antenna. He gives details regarding the materials used in manufacturing, the tuning process, the packaging and distribution/use of the antenna. Dave received his first ham license in 1956 at the age of 12. He is active in many ham activities. In his job at Larsen he has co-authored a patent for a capacitive coupled RF through a windshield design.

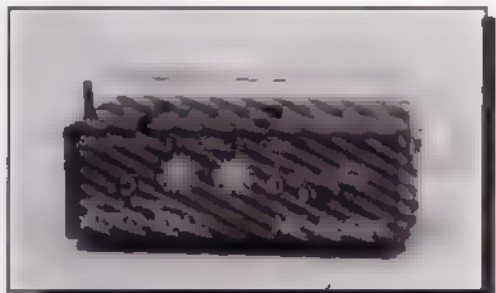
**Myths of Power Amplifier** Dan Peters, NY6U, covers some of the common myths and misunderstandings about matching an amplifier to the transmitter, power output capabilities, tuning and impedance matching. He has been a practicing engineer most of his professional life, eventually migrating into management. In 1984 he took the plunge and formed his own company, Falcon Communications.

**What Are Those Crazy Sounding Signals Saying?** Ernie Austin, W7AXJ and Roy Hanson, W7PJ, present a 40-minute video which provides an introduction to digital communications methods available to radio amateurs. Starting with slow speed CW (Morse) signals being decoded and printed on the video screen, it continues with high speed CW, RTTY, ASCII, AMTOR and Packet. Ernie and Roy will answer questions upon the completion of the video. Ernie has been licensed since 1922 and in the communications business until 1970. Roy has been licensed since 1930 and in the communications business until 1976. In their retirement, both are understandably interested in the latest developments in the amateur and commercial world.

**ARRL Sponsored Group Insurance Plans** Terry Bernier discusses the ARRL Equipment Insurance Plan and the ARRL Club Liability Insurance Plan. He will include details of the major points of coverage on both plans, and also go through an overview of claim circumstances to further identify the need for these membership service programs. Terry has 16 years experience in the insurance business having worked with The Travelers Insurance Co., and Albert H. Wohlers & Co. His current title is Vice President - Casualty/Property Operations.

(Continued, Page 22)

## INTRODUCING THE HF-ALERT NOW YOU CAN GIVE YOUR EARS A BREAK ON HF!



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**Navassa DXpeditions** Robert Shelton, Jr., N2EDF, offers a unique opportunity to hear how lessons learned at his first DXpedition (in 1985 as 6Y5NR/KP1) were applied this year when he operated as N2EDF/NP1. He shares his knowledge of the critical details of the all important planning phase as well as showing how he handled logistics and operations. Robert was first licensed in 1983 and also holds the call VP2MDF. He is an attorney who served as county supervisor for 10 years, a New Jersey legislator for two years and a New Jersey Superior Court judge for nine years. In 1985 he resigned to open a private practice.

**Volunteer Examiner Roundtable** An informal discussion designed for VE's to exchange ideas and solutions to problems. Discussion leader will be Jerry Seligman, W7BUN, with Randy Cobb, WN7W, and Armond Pilotte, WA7IIM. Featured guest will be Steve Place, WB1EYI, manager of the ARRL Volunteer Resources Group. This roundtable meeting is a must if you are an active VE.

**RFI - A Continuing Problem** Lew McCoy, W1ICP, is a retired senior technical editor of QST. Presently he is Technical Editor for CQ, and just this year received a Technical Merit Award at the Dayton Hamvention. His talk covers all forms of RFI and will show various causes and cures.

**The Mystique of Grounding** Alan Chandler K6RFK, discusses grounding and why it should not be overlooked by ham operators. Included will be some basics on what items should be grounded and how to best accomplish it. He holds a Ph.D. from the U of Washington. For his Ph.D. he performed ionospheric studies in Antarctica where he spent two years doing research. An Antarctic island, Chandler Island, is named in recognition of his work. He is presently Vice President of Engineering at Advanced Electronic Applications, Inc. (AEA).

**Computerized Satellite Identification, Selection, and Tracking** Ted Benson, WA6BEJ, describes the use of computers and software to: Select the most usable earth orbiting or geosynchronous satellites, automatically aim antenna arrays and maintain tracking and provide visual maps and data on the computer monitor. In addition he describes information related to moonbounce and radio-astronomy. Ted holds an advanced class license and a general phone commercial license with radar endorsement. He is Technical Editor for FRIENDX (The Newsletter of the North American Shortwave Association).

**Electronics and Communications in the FBI** Phil Chaney, W4NWZ, and Mel DeGraw cover electronics and communications systems in the FBI. They start with the mission of the FBI and include automated data processing efforts in the FBI. They will discuss careers in electronics and communications in the FBI and answer

questions on all aspects of the FBI's mission. Special Agent Philip Chaney is in charge of the Portland Division's technical investigative support and ADP programs. Special Agent Melvin DeGraw is in charge of the Portland Division's employee recruitment and hiring program.

**High Tech Astronomers Meet Ham Radio** Sandy Mikalow, K7OOZ, shows how high tech ham radio is linked to high tech astronomy at the Hamill Observatory. He describes how packet radio is used for control and for transmission of images. Sandy has worked at Tektronix for the last 15 years. He started the N.W. Astronomy net in 1978 and the N.W. Astronomy group (NWAG) in 1980. NWAG is a non-profit charitable trust.

**Transmitter Identification for Fun and Profit** Phil Ferrell, K7PF, describes a method of signal characterization and feature extraction which uniquely identifies each radio transmitter. Phil has been licensed since 1951 and has been active in VHF repeaters since 1965. He loves to combine his twin hobbies of amateur radio and computer hacking.

**Beginning Fast Scan ATV** Chuck Northcutt, W7SRZ, tells you how to get started in fast scan amateur television (ATV). He describes what equipment is needed, what kinds of antennas are suitable, DX operation and video production. Chuck comes from a family of three generations of hams. His father (W7FXD) and mother (K7KXT) are silent keys. His sons are Chuck Jr. (N7HZU) and Mark (KB7BTN). He is President of the Western Washington Amateur Television Society and vice president of the Sea-Tac Repeater Association. In addition he is assistant NW Director for the ARRL.

**The Flying White House - Air Force One** Van Valkenberg discusses his experiences as chief communicator on Air Force One. He has flown with all the US Presidents starting with Richard Nixon. He has also flown with all the Vice Presidents, Secretaries of State, many cabinet officers, congressmen and even other heads of state. His flights have taken him all over the world. He will answer questions (his previous talks have not resulted in any questions which he could not answer due to classified material). His hobbies include roller skating, water and snow skiing and skydiving. He has lived in the northwest since 1942 and is now retired after 37 years of service in the Air Force.

**Novices and Repeaters** M. Mark Walker, W7CLU, talks about repeaters, how they work, their operation, and any other topics of interest to those in attendance. His talk is targeted to any interested attendees, not just those new to this hobby. Mark received his novice license at age nine and has since designed and built antennas, transmitters, receivers, repeaters, radio control models and more. His experiments have covered HF,

VHF, and UHF. Mark is president of one of the largest non-profit repeater groups in the country which operates seven repeaters on three different bands. He is always willing to help new and old hams increase their enjoyment of this diverse and ever-changing hobby.

**Maximizing Trapped Vertical Efficiency** Ken Glanzer, K7GCC, provides insight and offers many practical suggestions for enhancing the performance of a very common yet useful HF antenna, the 1/4 wave trapped vertical. Ken has made a number of technical contributions in the area of amateur radio antennas, and continues sharing his knowledge via relevant articles and presentations. Actual on-the-air performance of verticals versus other HF antennas is compared. Useful hints are presented for getting the most from your HF vertical and keeping it at peak performance.

**Hamming in Nepal** Father Moran, 9N1MM. Details of Father Moran's seminar were not available at presstime.

**Traveling Wave Tubes for Amateur Radio Microwaves** Tom Hill, WA3RMX, talks about ham radio's new frontier, the microwave bands, where there are new developments and new records almost every month. Traveling wave tubes are one of the most common ways of generating medium to high power in the microwave bands. Tom will show the basics of how TWT's work, how to find and identify them, and tell how to repair and convert them for amateur radio use. Tom has been building ham microwave rigs for over 10 years and has built gear for all the microwave ham bands up through 47 GHz. He is co-holder of the North American DX records on both the 24GHz and the 47GHz bands, and has VUCC on 3.4, 5.6, 10 and 24 GHz. He is a Principal Engineer at Tektronix, Inc. where he designs spectrum analyzers.

**DX Contest Logging Accuracy Study** Dick Norton, N6AA, talks about his study of accuracy of call sign copying and logging during a DX contest. The computerized data base used 220 band logs consisting of about 150,000 QSO's. Variations in operator performance are discussed together with suggestions for improvement. Dick has been world-high both modes in the CQ DX contest many times as 9Y4VT, EA9IE and KH6RS.

**Packet Radio Satellites and TAPR's DSP Project** Harold Price, NK6K, discusses the near future in packet radio: digital store and forward satellites, the dedicated mailboxes in the sky. He then discusses a modem done in software, one generic hardware device masquerading as several different modems. You just change the software to change characteristics. He also covers other TAPR topics. Harold has been involved with packet radio since 1982. He developed early packet software, is a TAPR director and a past AMSAT director.



**Antennas and Towers: Practical Hints** Kenneth Kopp, KØPP, presents a wide range of ideas for putting up antennas and towers. Kenneth works as a communications technician for Montana Power Company. He has been a licensed operator for more than 35 years and is very active in ARRL. He is noted for his down to earth presentations on ham radio related subjects

**Practical Filter Design for the Experimenter** Wes Hayward, W7ZOI, talks about how the methods used to design and build filters has evolved in recent years. Some of the methods actually simplify the problem for the experimenter with minimal test equipment. This talk will include information on the newer low pass filters, crystal filters built from available crystals, and coupled-resonator LC bandpass filters at HF through UHF. The emphasis is confined to methods that can be applied by the experimentally inclined radio amateur. Wes has been an active radio amateur since first licensed in 1955. His primary ham interest has been in battery operated portable equipment for use in the mountains of the western states

**RTTY for Beginners** Bill Henry, K9GWT, presents a tutorial on Radio Teletype. He covers beginner techniques, explain the terms, and offer suggestions on how to handle keyboard fright. Bill is a life member of the ARRL and the QCWA. He is an author of numerous amateur radio articles. He founded Hal Communications in 1967 and is a leader in communications technology.

**The ARRL VEC Program** Steve Place, WB1EYI, presents a review of the ARRL Volunteer Examiner Co-ordinator program and shows how it fits in with the overall ARRL operation. He has new information regarding changes to enhance the field organization. He is the Manager of the Volunteer Resources Group (which includes the VEC program) at the ARRL headquarters. He is also secretary of the ARRL Foundation.

**New Horizons in Data Communications** Phil Anderson, WØXI, tells us what's new in amateur and commercial data communications, and what's on the horizon for the 1990's. He covers packet protocols, modems, and gives you a look at new modes. He even looks at meteor scatter—a new horizon. Phil is President and CEO of Kantronics, Inc. He is an author of amateur radio books and holds a Doctorate of Engineering and is an Adjunct Professor and Lecturer in Electrical Engineering at the University of Kansas.

**VHF Tropoducting to Hawaii - Here's How** Gordon West, WB6NOA, gives you the latest news about tropospheric ducting between Hawaii and the mainland. Listen to exciting tropo communications recorded from 2 meters through 1296 MHz. Listen to the difference between SSB and FM through the duct. See actual weather facsimile satellite imagery to better understand how the summertime Hawaii/mainland tropo duct

forms. Learn how you can take part in this exciting phenomena that occurs every July and August. Who will be the first station in Washington to successfully work the Hawaiian Islands on tropo? Gordon is very active in amateur radio activities and was recently nominated Instructor of the Year for the ARRL. He is deeply involved in microwave work, and enjoys teaching other hams the excitement of line-of-sight frequencies that go well beyond the visual horizon.

**Introduction to Traffic Handling and Message Preparation** Brad Wells, KR7L, provides an introduction to the ARRL national traffic system. The primary emphasis is on the proper use of the ARRL Radiogram. Basic operating and message delivery techniques will also be covered. This seminar teaches the fundamentals of traffic handling and basic skills for net operation. Brad is the ARRL Section Manager for Washington and has been active in the National Traffic System for the past 7 years. He has also written a number of articles on traffic handling (and other subjects) for *QST*, *CQ*, *Ham Radio*, and 73 magazines.

**An Introduction to Packet Radio** Al Rovner, WA2TMP, covers the basics of packet radio. Topics to be discussed include a comparison of packet and RTTY modes, what equipment is necessary to get on packet, an X.25 protocol description and internal workings of a TNC. A demonstration will also be given to show digipeater and network operations. Al has been an active packeteer for almost five years. He maintains a NET/ROM based digipeater which covers the Portland region. He is a Hardware/Software engineer in the Portable Oscilloscopes Division of Tektronix, Inc.

**DXpedition** Several interesting presentations are planned for this time slot. First, Jim Neiger, N6TJ, presents a series of slides and discusses his operation from the Cape Verde Islands at D44BC and from Egypt as SU1ER. Jim is a superb operator and his many trips to exotic DX locations have give the DX fraternity opportunity to work rare and exciting countries. Next Burt Myers, WØRLX, presents a series of slides that describe his recent DXpedition to Palmyra Island (KH5) and Kingman Reef (KH5K). Burt is an experienced DXer, having operated in the past from VP2E, HD8X and XF4DX. Other slide presentations of recent DX activity are also planned.

**Radiation Hazards of Ham Radio** Wayne Overbeck, N6NB, introduces some of the concerns which ham operators should take into account regarding RF radiation. He has been a ham since 1957 and is active in DX, VHF and contests. He is an attorney with a Ph.D. from UCLA and has published four books and 25 articles. He is an ARRL Vice Director for the S.W. Division.

**Phased Array Antennas** Roy Lewallen, W7EL, teaches you how phased arrays are supposed to work, and why they frequently don't. Simple phased array feed systems that do work will be presented and explained. Roy will share his experience in building, feeding, adjusting, and testing phased arrays. Bring your questions to this seminar! Roy has been licensed since 1957 and has been searching for better antennas ever since. He has shared the results of his search in numerous presentations at clubs and hamfests and in *QST* magazine. Most recently, Roy wrote the "Phased Array Techniques" and "Practical Aspects of Phased Array Design" sections of the new (15th) Edition of the *ARRL Antenna Book*.

**Packet and Traffic** Phil Dunn, KD7ME, Vic Seiberger, W7VSE, and Bill Smith, W7GHT, discuss the proposed NTS packet procedure along with recommendations for future packet traffic. Also included are information on station access and recent recommendations. Phil is STM for Washington, Vic is STM for Oregon, and Bill is STM for Idaho.

**Extended Packet Radio Networks** Budd Churchward, WB7FHC, will provide a detailed description of the extended packet radio network developed in the Pacific Northwest. Emphasis will be placed on the RF cell isolation for user LAN's and careful planning when creating a 220 MHz backbone. A unique solution to the problem of converting the 1200 baud packet backbone extending from central Oregon throughout Washington, and into British Columbia to a high speed, state of the art, system will be included. Budd has been a member of the board of directors of the Northwest Amateur Packet Radio Association since its creation in 1984 and is the current president of the group.

**SWR** Lew McCoy, W1ICP, is a retired senior technical editor of *QST*. Presently he is Technical Editor for *CQ*, and just this year received a Technical Merit Award at the Dayton Hamvention. His talk covers SWR.

**ARES/RACES - A Vital Link With Government In Disaster Management** Jan Smith, KB6WJZ, covers the development and implementation of an ARES/RACES program in local government. Included are approaches to becoming part of the team in government, the roles and responsibilities of the ARES/RACES members and of the government, the training and equipment needs, working together in emergency and non-emergency situations and planning for the future. Jan is Education officer for the Ventura County, California Sheriff's Department, Office of Emergency Services. Each month she conducts approximately 30 Emergency Preparedness Programs reaching 3,000 to 5,000 citizens. As a result of seeing the importance of amateur radio operators during her work assignments, she decided to become one.

(Continued, Page 26)



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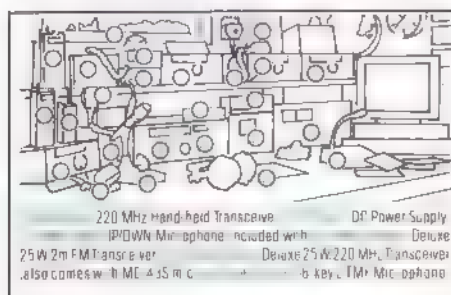
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### Packet Radio - Where Do We Go From Here?

Paul Rinaldo, W4RI, touches briefly on where we are today in packet radio. He describes the trends in growth of the network. He will discuss options for future development of packet radio techniques and services. Paul is the Publications Manager for ARRL and Editor of QST. In addition, he is the chairman of the ARRL's Committee on Amateur Radio Digital Communication.

**The International Amateur Radio Union Monitoring Service** M. L. "Gib" Gibson, W7JIE, describes the International Amateur Radio Union (IARU) and how it functions. He describes signals which he has overheard and discusses what they mean and who probably interferes with amateur radio. Gib was first licensed in 1946 and received his extra class in 1969. You can find him mostly operating CW QRP. He has been the IARU regional coordinator for North and South America since 1980.

**Techniques and Morals of Computer Aided Contesting** Larry Tyree, N6TR, gives an explanation of attempts to use computers in a real time contesting environment including duping, spotting, multiplier search and total station control. Discussion of the morals of using such devices and how they should be regulated is included. He describes the technical problems encountered when he built a totally automated station capable of operating a contest with no human intervention. He is an engineering manager with 14 years design experience with hardware/software systems. He has 20 years experience in contesting and has placed consistently high in national competition during the last 12 years.

**The Evergreen Intertie** Gene Holt, WA7PUD, discusses the Evergreen Intertie, a vast project involving the linking of many repeaters. There will be a discussion of various linking problems. Also discussed will be signaling and coding techniques, existing equipment and future plans.

**A New Computer Controlled Communications Receiver** Brian Comer, KF6C, starts with a general description of the receiver. He examines the block diagram, describes the software architecture, the distribution within the various system processors and the compromises which have to be made in the design. He has been licensed since 1968. Under his English call, G3ZVC, he wrote an article on an SSB Transceiver module which was published in *Ham Radio* and other magazines. He has worked as an RF semiconductor applications engineer and RF design consultant for 18 years.

**HF Linear Amplifier Design and Operation** Ray Heaton, NJ0G, starts with a generic coverage of the general topic. His presentation will be tailored to the technical level and interests of the audience. Questions are encouraged, so bring them to this seminar. Ray is customer service and sales manager of the communications products group of ETO. He personally handles all written and telephone inquiries for his group.

### New Products, Neat Accessories, and Nifty

**Links** Linda Rae Clark, N6QYU, and Michael Young, WB8CXO, provide descriptions of the RC-96 Controller and the RC-850 Computer Interface Option followed by a discussion of the Digital Voice Recorder and its applications. In addition, they include a brief talk on the Audio Delay Board option for the RC-85 and RC-96 controllers. Links and remote bases will be discussed. The application and integration into communication systems, as well as supporting hardware and software will be included in this portion of the talk. Linda is an administrative assistant and has been with ACC for two years. She has a B.S. degree in Physics and has taught algebra and physical science at the college level. She operates several 220 MHz repeaters in northern California. Michael has been a central office technician with Ohio Bell Telephone since 1969. He enjoys building repeaters and remotely controlled communication systems when he's not flying his plane or scuba diving.

**All You've Wanted To Know About HF Propagation... But Were Afraid To Ask** Lee Wical, KH6BZF, covers all aspects of propagation from 160 meters through 432 MHz: meteor shower, TE, ES, beacons, do-it-yourself propagation analysis, what to look for, paths, contest preparations, what to look for in sunspots, solar flux vs. SSN's, AP, muf, LOT, FOT, etc. Lee's professional background includes 35 years experience in communications and electronics. He is a "ham's ham" who has discovered one of the basic laws of life and has remembered to "...put some of himself back into amateur radio, the reservoir he has derived such pleasure from..." (quoted from March 1986 issue of QST). He is very active in amateur radio groups and is assistant director for the ARRL Pacific Division.

**Phase Noise in Modern Transceivers** Fred Telewski, WA7TZY, discusses phase noise and amplitude noise measurements and their relevance to receiver/transceiver performance. HF, VHF, and UHF communication systems are all affected by this problem. Actual results of measurements made on several popular transceivers in the laboratory will be shown. Fred is Product Development Unit Manager of Calibration and Communication Products for John Fluke Company. He has been a ham for approximately 30 years.

**Passing the VEC Code Exams** Loraine McCarthy, N6CIO, reviews successful hints on how to prepare for the code exams, how to read your copy, and how to cope with the actual test situation. Loraine is Code Programs Manager for the Gordon West Radio School, and she is also a columnist for WorldRadio Magazine.

**How High Is High?** Greg Milnes, W7AGQ, talks about antenna and tower regulations. Yes, government can still regulate height and you can be required to obtain a building permit. Guess what? The FAA can limit tower height also. Greg was first licensed in 1956 and is quite active in various ham club activities. Professionally he is a circuit court judge for the state of Oregon.

(Continued, Page 28)

## VE Testing Information

License exams will be given at 2 sessions on Saturday, September 10, in the Willamette Room, Red Lion Inn/Columbia River (across the freeway from the rest of the convention). Testing will begin at 9 a.m. and 1 p.m. **SHARP.**

Walk-ins will only be admitted to either session as space permits. The usual requirements apply: 2 pieces of I.D. including your original license (if you have one), and \$455 payable to ARRL/VEC. If you are walking in, you should be there at least an hour early to complete paperwork. Good Luck!

## The Convention Station

The official on-site Convention Station, using the call sign of W7KYC, will be on the air throughout the period of the convention (September 8-11). In addition to its obvious function of providing talk-in assistance, we are set up with the latest in equipment from the major manufacturers. Here's your chance to test-operate that new rig! What's more, we invite you to stop by Room 402 and visit W7KYC during the open hours of the convention to operate. The Convention Station Committee would like to thank and acknowledge the various manufacturers and vendors who donated the gear for the station. We also wish to acknowledge with thanks the Amateur Radio Relay Group's clearance to use their repeaters for talk-in.



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This "super hot" general coverage receiver beats even much higher priced radios with its  $0.25\mu\text{V}$  (or better) sensitivity, dual VFO's, RIT, 500 Hz CW filter, "Split" operation, receiver squelch in all modes, 20 memories to hold your favorite frequencies, "operator preferred" front panel layout, computer interface and front panel selected AGC action.

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**Specifications Receiver:** 100 kHz-30 MHz, Sensitivity SSB & CW  $0.25\mu\text{V}$  above 1.5 MHz,  $0.5\mu\text{V}$  (500 KHz-1.5 MHz), AM  $1\mu\text{V}$  above 1.5 MHz, FM (option)  $0.7\mu\text{V}$  for 12 dB SINAD above 28 MHz, IF freq 47.055, 8.215 MHz (and 455 KHz FM triple conversion), Image rejection >70 dB above 1.5 MHz, IF Rejection >60 dB above 1.5 MHz, Selectivity SSB, CW (W), AM (N) 2.2 KHz at -6 dB, 5 KHz at -60 dB, CW (N) 500 Hz at -6 dB, 1.8 KHz at -60 dB, **Transmitter:** 160, 80, 40, 30, 20, 17, 15, 12, 10 meter Amateur Bands, Output SSB, CW and FM 100 W PEP, AM 25 watt carrier, Exceeds FCC requirements for harmonic and spurious output, RF connector SO-239 type, **Supply Voltage:** 13.5 VDC 19 amps max @  $\pm 10\%$

**Heath Tunes You In** at the 1988 ARRL National Convention. Stop by our booth and see the NEW SB-1400 and our full line of technically advanced amateur radios. Make sure you pick up a **FREE** copy of the Heathkit catalog - 108 color pages of the latest electronic products in kit and assembled form.

## Heath Company



## FORUMS

**Public Service Forum** Luck Hurder, KY1T, Jan Smith, KB6WJZ, and Stanly Harter, KH6GBX, will lead the forum on this important aspect of amateur radio. The forum will focus on the new RACES and the frequent use of amateur radio in local and state emergencies. Jan Smith is Education Officer for the Ventura County, California, Sheriff's Office. Luck Hurder is from ARRL Headquarters, where he works with the Public Service programs. Mr. Harter is Assistant Chief, Telecommunications Division, State Amateur Radio Service Coordinator for the Office of Emergency Services, State of California. His experience includes offices in APCO, IEEE and FEMA.

**MARS Forum** Joe Noecker, N7HMY, hosts this forum covering the past, present and future of the MARS (Military Amateur Radio Service) program. Joe holds an Extra class license and continues to make public service contributions via MARS, ARES and the American Red Cross. Joining Joe will be representatives from all three services. From the Navy is Senior Chief Radioman Tofu Asaeli. The forum includes presentations by the service representatives covering such topics as the mission of MARS along with a comparison between MARS and the hobby of amateur radio. A general question and answer session follows.

**Youth Forum** Tony England, W0ORE, Gordon West, WB6NOA, and Carolyn Pasquier, KA7TGL, lead an exciting program for young persons who are interested in what Amateur Radio is about. Many aspects of amateur radio will be graphically demonstrated, using state-of-the-art equipment. Some of those will be a hands-on experience for the young attendees. This program should be a must-see, not only for youth, but for any family member who has been considering taking up ham radio as a hobby. A large number of invitations describing this event have been sent to schools and youth groups in the Portland area. There is no convention registration charge for anyone age 18 and under.


**Contest Forum** Dale Jones, K5MM moderates a panel composed of one of the best assemblies of world class operators to ever sit together at one time. Among those attending the convention and may be participating are K7JA, K7SS, K7WA, N6AA, N6TJ, N7ZZ, K6NA, K1KI, and N6TR, all winners of national and international contests both from the U.S.A. and abroad. There are a number of hot subjects facing the contest fraternity at this time which will be discussed. This should be a great session, so if contesting is your bag you better get there early.

**FCC Forum** Ralph Haller, N4RH, Chief, Private Radio Bureau, and John B. Johnston, W3BE, Chief of Personal Radio Branch, lead this session. This meeting offers a wonderful opportunity to hear first hand from the FCC personnel whose decisions can affect the future of Amateur Radio. Topics that will most likely be discussed are Reorganization and Deregulation of Part 97 of the Rules Governing the Amateur Radio Service, the 220 MHz controversy, and PRB 3, the Special Call Sign proposal. There are other actions pending, and it is probable that other matters will come up that will be of interest to the amateur community. There will be ample opportunity to question Haller and Johnston during this session.

**AMSAT Forum** Ross Forbes, WB6GFJ conducts the AMSAT Forum. Ross is the AMSAT Regional Coordinator for the West Coast and President of Project OSCAR. The program covers the operation and use of OSCAR 13 in detail. There will be ample time for questions and answers.

**DX Forum** During the DX Forum, Chod Harris, VP2ML, editor of the *DX Bulletin*, will describe the pain and agony of putting together the weekly *DX Bulletin* and will field questions from the audience regarding his publication. In addition, there will be a "Blue Ribbon" panel fielding questions from the audience and discussing current issues regarding DX and DXing. Participating on this panel will be K7ZR, W6CF, W3AZD, OK3GI, and others. Come prepared to discuss your important issues and feelings concerning DX and DXCC.

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## Flea Market

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Jack Ellis, K7SUQ  
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Ralph Karls, WB7VGS  
Paul Lucas, WB6SHR  
Jim Zeigler, KA7TAC

## Meals & Speakers

Ray Deeth, K7VDQ, Chair  
Bobbi Antons  
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## Participating Organizations

Oregon-Tualatin Valley Amateur Radio Club  
Portland Amateur Radio Club  
Radio Amateurs of the Gorge  
Tektronix Employees Radio Amateur Club  
Tillamook Emergency Amateur Radio Society  
Willamette Valley DX Club

## Coming Events: Walla Walla Hamfest

The Walla Walla Hamfest is one of the long-standing events in the Northwest. It is held Saturday and Sunday, September 24 and 25 at the Community Bldg. in Milton-Freewater, Oregon (no tax in Oregon, remember?) Registration and swap tables are free. For further information, contact: **Paul Hamon, KA7VHL**, P.O. Box 321, Walla Walla, WA 99362, telephone (509) 525-0512.

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# WIRELESS DATA RECORDER

# AR1200

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## SPECIFICATIONS

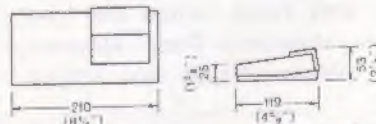
### GENERAL

Protocol	AX 25 level 2
Modem	VHF/AFSK
Processor	Z80 Software compatible
Memories	ROM 32K, RAM 32K
Communication speed	1200bps (wireless)
at RS232C terminal	1200bps (300-9600bps rate selective)
Power source	DC-12V $\pm$ 15%
Current drain	700mA average
Operating temperature	0 - +40 degree C
Storage temperature	-20 - +60 degree C

### PRINTER

Printing method	Thermal head
Letter structure	7 x 5 matrix
Printing space	2 dots
Letter size	2.4 x 1.1 mm Characters/Numerics/Marks
Characters per line	40 characters
Paper	Thermal sensitive only
Paper size	80mm 1/2 width 40mm diameter of roll

Dimensions:  
(mm)



Specifications subject to change without notice



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It's a lesson you learn very early in life. Many can be good, some may be better, but only one can be the best. The PK-232 is the best multi-mode data controller you can buy.

## 1 Versatility

The PK-232 should be listed in the amateur radio dictionary under the word Versatile. One data controller that can transmit and receive in six digital modes, and can be used with almost every computer or data terminal. You can even monitor Navtex, the new marine weather and navigational system. Don't forget two radio ports for both VHF and HF, and a no compromise VHF/HF/CW internal modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold control.

The internal decoding program (SIAM<sup>tm</sup>) feature can even identify different types of signals for you, including some simple types of RTTY encryption. The only software your computer needs is a terminal program.



PC Pakratt Packet TX/RX Display



Facsimile Screen Display

## 2 Software Support

While you can use most modem or communications programs with the PK-232, AEA has two very special packages available exclusively for the PK-232....PC Pakratt with Fax for IBM PC and compatible computers, and Com Pakratt with Fax for the Commodore 64 and 128.

Each package includes a terminal program with split screen display, QSO buffer, disk storage of received data, and printer operation, and a second program for transmission/reception and screen display of facsimile signals. The IBM programs are on 5-1/4" disk and the Commodore programs are plug-in ROM cartridges.

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No matter what computer or terminal you plan to use, the PK-232 is the best choice for a multi-mode data controller. Over 20,000 amateurs around the world have on-air tested the PK-232 for you. They, along with most major U.S. amateur magazines, have reviewed the PK-232 and found it to be a good value and excellent addition to the ham station.

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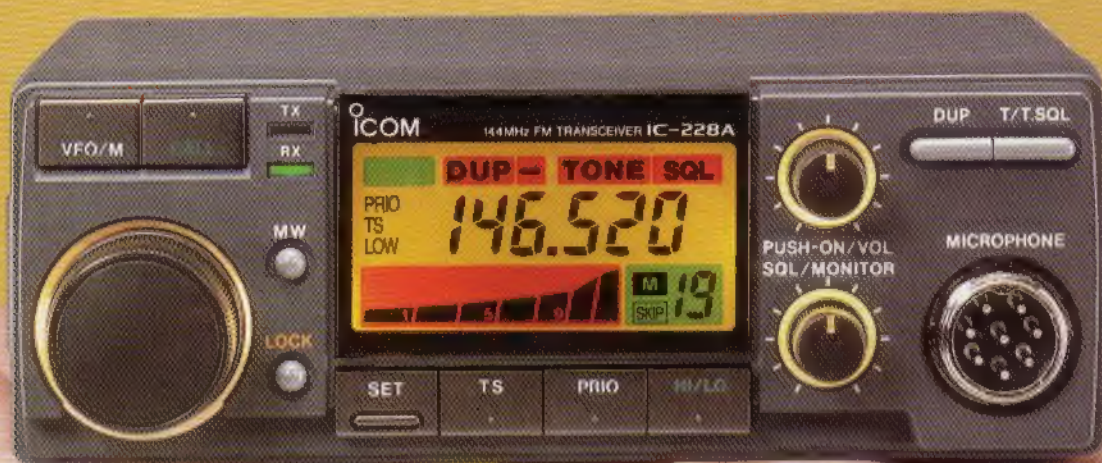
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## DUPLEX INDICATOR

Indicates plus or minus duplex.

## PRIORITY WATCH

Monitor any channel for calls while continuing operation on another frequency.

## TUNING STEP INDICATOR

Programmable tuning steps of 5kHz, 10kHz, 15kHz, 20kHz or 25kHz.

## 45 OR 25 WATTS

The IC-228H delivers 45 watts; the IC-228A 25 watts. Both include selectable low power.

## SRF INDICATOR

Shows signal strength when receiving, and relative output power selection when transmitting.

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Includes all subaudible tones built-in. TONE appears when the tone encoder is turned on. SQL lights when the optional UT-40 pocket beep function is activated (silently monitors for calls with your pre-programmed tone).

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Full reception of 138-174MHz including public service and NOAA weather bands. Transmit range of 140-150MHz includes MARS and CAP frequencies.

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